

## AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

### **Listing of Claims:**

1. (Currently Amended) A method for multi-objective portfolio optimization ~~for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem in a space~~ analysis using dominance filtering, the method comprising:
  - (a) generating a first set of solutions of portfolio allocations in the a portfolio configuration space using a computing device, the portfolio configuration space having a plurality of dimensions;
  - (b) generating a second set of solutions in a portfolio performance space, the portfolio performance space having at least three dimensions; each solution in the first set of solutions matching with a corresponding solution in the second set of solutions;
  - (c) selecting a first dimension from the plurality of at least three dimensions of the portfolio performance space; ~~the first dimension being a dimension under consideration;~~
  - ~~dividing~~ (d) generating bins for the all remaining non-selected dimensions of the portfolio performance space; into bins based on each dimension in the plurality of dimensions other than the dimension under consideration;
  - (e) determining a respective point solution in each bin of the non-selected dimensions with the most extreme a maximum value along the selected dimension; in the dimension under consideration;
  - (f) comparing the solution with the maximum value in each bin to other solutions in each bin to determining, based on the point in each bin with the most

~~extreme value, determine whether the other points in the space solutions are dominant solutions or dominated solutions; and~~

~~(g) removing the dominated points-solutions from further consideration, the portfolio performance space so as to result in a reduced set of solutions, the reduced set of solutions being used in investment decisioning decisions.~~

2. (Currently Amended) The method of claim 1, the method further including[[],] the step of repeating steps (c) – (g) for at least a second dimension of the portfolio performance space after removing the dominated points-solutions are removed from the portfolio performance space, further consideration:

~~—— selecting a second dimension from the plurality of dimensions, the second dimension being a second dimension under consideration;~~

~~—— dividing the space into bins based on each dimension in the plurality of dimensions other than the second dimension under consideration;~~

~~—— determining a respective point in each bin with the most extreme value in the second dimension under consideration;~~

~~—— determining, based on the point in each bin with the most extreme value in the second dimension under consideration, whether other points in the space are dominant or dominated; and~~

~~—— removing the dominated points from further consideration, so as to result in a further reduced set of solutions.~~

3-5. (Canceled)

6. (Currently Amended) The method of claim 1, wherein the plurality of dimensions is n-dimensions, and the bins are in the form of n-1 dimensional polyhedra in the portfolio performance space.

7. (Currently Amended) The method of claim 1 further including the step of performing a final dominance check on the further-reduced set of solutions.

8-10. (Canceled)

11. (Currently Amended) The method of claim 1, wherein the investment decisions are based on competing objectives that include risk and return.

12. (Currently Amended) The method of claim 1, further including the step of repeating steps (c) – (g) for all remaining dimensions of the portfolio performance space after the dominated points are removed from the portfolio performance space;  
~~after obtaining the reduced set of solutions, progressing through the remainder of the plurality of dimensions taking each dimension as the dimension under consideration in turn, in conjunction with binning in the space based on each and every dimension not under consideration.~~

13. (Currently Amended) The method of claim 12, wherein ~~the a~~ coarseness of the binning bins is decreased as further remaining dimensions of the portfolio performance space are considered selected, as the dimension under consideration.

14-15. (Canceled)

16. (Currently Amended) The method of claim [[1]]Z, wherein the step of generating a set of solutions of portfolio allocations performing the final dominance check on the reduced set of solutions includes ~~the generation of~~ generating an efficient frontier.

17. (Currently Amended) The method of claim 1, wherein the step of generating [[a]] the first set of solutions of portfolio allocations includes using an evolutionary algorithm, ~~to generate an efficient frontier.~~

18. (Currently Amended) The method of claim 1, wherein the ~~determining, based on the point in each bin with the most extreme value, whether other points in the space are dominant or dominated~~ step of comparing the solution with the maximum value in each bin to other solutions in each bin includes using ~~a definition of Pareto dominance that extends to~~ includes uncertainty uncertainties in the measurement of the measuring competing objectives.

19. (Currently Amended) A system for multi-objective portfolio ~~optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem in a space~~ analysis using dominance filtering, the system comprising:

a population generation portion that generates a first set of solutions of portfolio allocations in the a portfolio configuration space, ~~the space~~ having a plurality of

dimensions, and a second set of solutions in a portfolio performance space having at least three dimensions, each solution in the first set of solutions matching with a corresponding solution in the second set of solutions;

a dominance filtering portion that selects a first dimension from the plurality of at least three dimensions of the portfolio performance space, the first dimension being a dimension under consideration, the dominance filtering portion:

dividing the space into generates bins based on each dimension in the plurality of dimensions other than the dimension under consideration for all remaining non-selected dimensions of the portfolio performance space;

determining-determines a respective point solution in each bin of the non-selected dimensions with the most extreme a maximum value in the dimension under consideration along the selected dimension;

determining, based on the point in each bin with the most extreme value, compares the solution with the maximum value in each bin to other solutions in each bin to determine whether the other points in the space solutions are dominant solutions or dominated solutions; and

removing-removes the dominated points-solutions from further consideration, the portfolio performance space so as to result in a reduced set of solutions, the reduced set of solutions being used in investment decisioning decisions.

20. (Currently Amended) The system of claim 19, wherein the dominance filtering portion, after removing the dominated points-solutions from further consideration, the portfolio performance space, selects a second dimension from the at least three dimensions of the portfolio performance space; generates bins for all remaining non-selected dimensions of the portfolio performance space; determines a solution in each bin of the non-selected dimensions with a maximum value along the selected dimension; compares the solution with the maximum value in each bin to other solutions in each bin to determine whether the other solutions are dominant solutions or dominated solutions; and removes the dominated solutions from the portfolio performance space so as to result in a second reduced set of solutions.

~~—selecting a second dimension from the plurality of dimensions, the second dimension being a second dimension under consideration;~~  
~~—dividing the space into bins based on each dimension in the plurality of dimensions other than the second dimension under consideration;~~  
~~—determining a respective point in each bin with the most extreme value in the second dimension under consideration;~~  
~~—determining, based on the point in each bin with the most extreme value in the second dimension under consideration, whether other points in the space are dominant or dominated; and~~  
~~—removing the dominated points from further consideration, so as to result in a further reduced set of solutions.~~

21. (Canceled)

22. (Currently Amended) The method of claim 19, wherein the plurality of dimensions is n-dimensions, and the bins are in the form of n-1 dimensional polyhedra in the portfolio performance space.

23. (Currently Amended) The system of claim 19, wherein the dominance filter portion, further including, after obtaining the reduced set of solutions, progressing through the remainder of the plurality of dimensions taking each dimension as the dimension under consideration in turn, in conjunction with binning in the space based on all the dimensions not under consideration, until each dimension has been considered, after removing the dominated solutions from the portfolio performance space, selects each of all the remaining dimensions from the at least three dimensions of the portfolio performance space; generates bins for all remaining non-selected dimensions of the portfolio performance space; determines a solution in each bin of the non-selected dimensions with a maximum value along the selected dimension; compares the solution with the maximum value in each bin to other solutions in each bin to determine whether the other solutions are dominant solutions or dominated solutions; and removes the dominated solutions from the portfolio performance space so as to provide result in a further final reduced set of solutions.

24. (Currently Amended) The system of claim 23, wherein, ~~after each dimension has been considered,~~ the dominance filtering portion ~~performing~~ performs a final dominance check on the ~~further~~ final reduced set of solutions.

25-26. (Canceled)